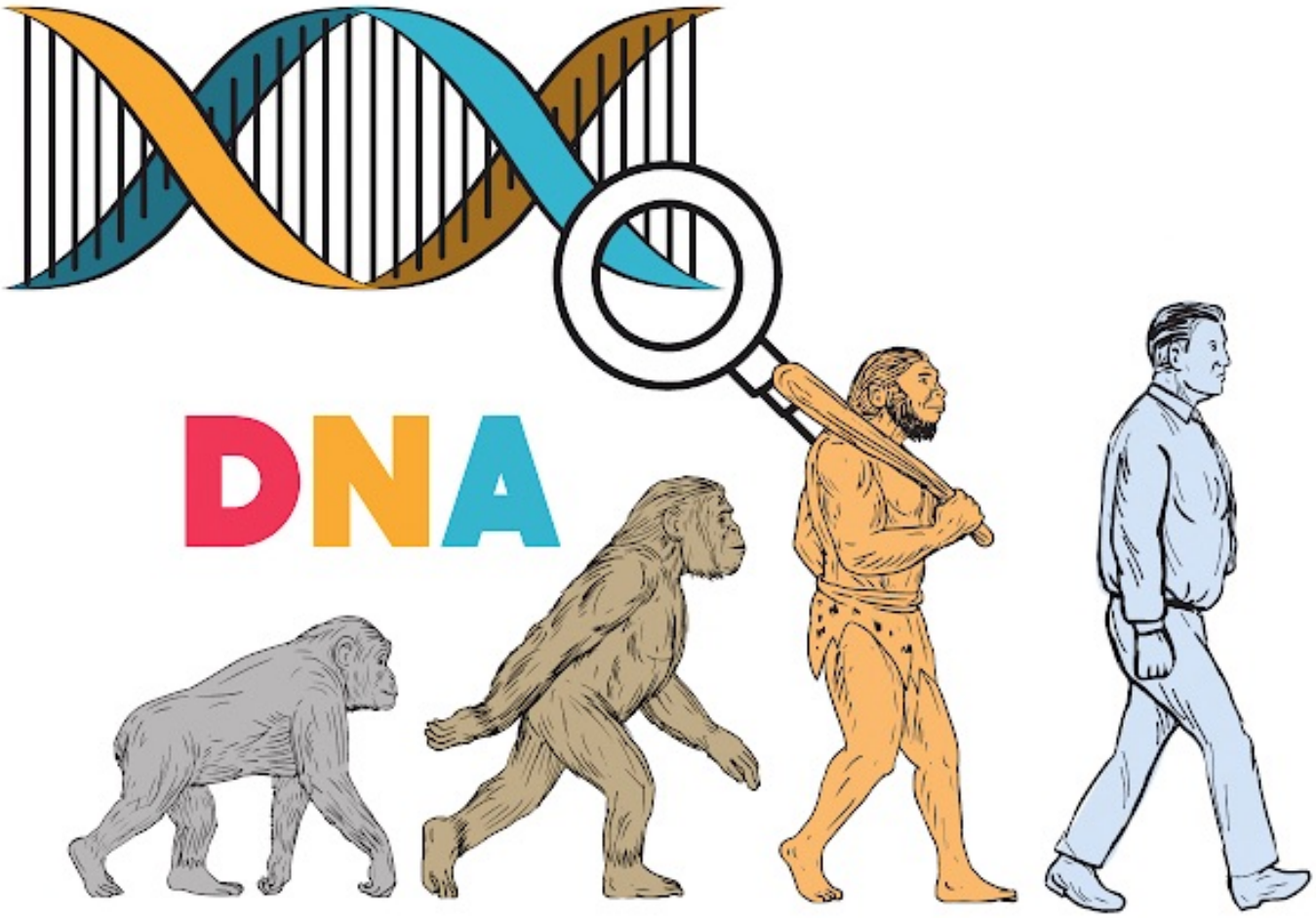
Heredity & Evolution

HANDWRITTEN NOTES

[Prv. Years Included]



Designed With ♥

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Genetics- It deals with study of heredity and variation.

Heredity - The transmission of characters/traits from one generation to next generation is called Heredity.

Variations - The differences in the characters/traits among individuals of a species are called variation.

Causes of Variation :-

(i) Genetic Variations : Mutation (sudden inheritable change in gene or chromosome)

(ii) Environmental factors : → Diets
→ Chemicals
→ Pollution

Importance of Variation are :

(i) It is basis of heredity.

(ii) Adaptability to adverse conditions is due to variation.

(iii) New varieties of an organism may arise due to variation and form in raw materials for evolution.

Inherited Traits - These are traits or characteristics which are based on from parents to their offsprings generation and are controlled by genes. Eg - height, skin colour etc.

Gregor Johann Mendel - Some of the basic laws of inheritance were proposed by him and now he is known to world as the father of Genetics.

→ Mendel opted garden pea to conduct his experiments.

→ He selected garden pea for his experiments as-

(i) these grow quickly and are easier to study.

(ii) pea plants can be crossed or self pollinated.

(iii) Several pair of contrasting traits are visible within the same plant round/wrinkled seeds, tall/short plant, white/violet flower.

Some Important Terms :

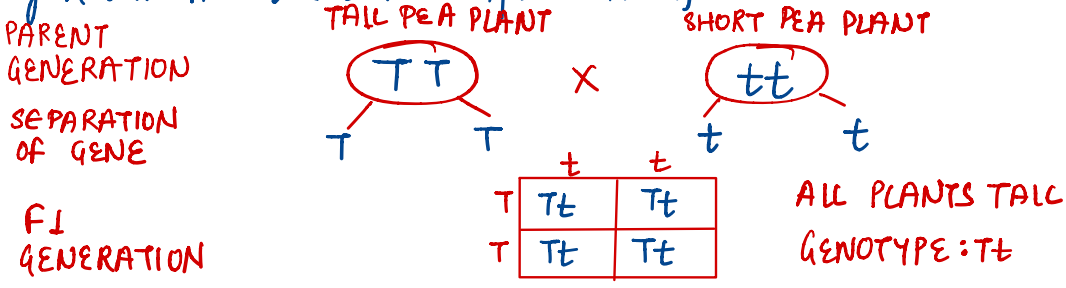
- Allele - One of different forms of particular gene. eg-height.
- Dominant Allele - An allele, whose phenotype will be expressed even in presence of another allele. It is represented by capital letter eg. T.
- Recessive Allele - Presence of both the allele is must for phenotype to be expressed. It is represented by small letter. eg: t.
- Genotype - Genetic composition of an individual. eg - pure or hybrid tall.
- Phenotype - Physical characteristics. eg - tall or dwarf.
- Punnet squares - Probability diagram, illustrating the possible offsprings.
- Chromosomes - A long rod-like structure present in nucleus.

- Hybrid - An individual having two different alleles for same trait. eg: Tt(tall)
- Monohybrid Cross - The cross in which one pair of contrasting trait is taken into consideration that is known as monohybrid cross, and the ratio 3:1 which we obtain in the monohybrid cross is called monohybrid ratio.
- Dihibrid Cross - The cross in which two pair of contrasting trait are taken into consideration is called dihybrid cross, and ratio 9:3:3:1 which we obtain in the dihybrid cross is called dihybrid ratio.
- Dominant Trait - The trait which is able to express itself in F1 generation.
- Recessive Trait - The trait which is not able to express itself in F1 generation but reappears in F2 generation.
- Homozygous - Similar type of gene.
- Heterozygous - Different type of gene.
- Dominant Gene - The gene which is able to express itself in both homozygous and heterozygous condition.
- Recessive Gene - The gene which able to express itself only in homozygous condition.
  - → Inheritance from the previous generation provides both a common body design, and subtle changes in it for the next generation.
  - → Depending on the nature of variations, different individuals would have different kinds of advantage.

Acquired Traits	Inherited Trait
(i) Not present in the reproductive cell	(i) Present in the reproductive cell.
(ii) We acquire it from surroundings. eg - Traits of speaking English.	(ii) We inherent it from our parents. eg - Colour of skin.

Mendel's Experiment

Traits may be dominant or recessive. When Mendel cross pollinated tall peaplant with short pea plant, he obtained all tall pea plants in F1 generation. In order to understand what happened to the trait of short height he self-pollinated the plants F1 generation, in F2 generation he observed that trait of short height was also present. Both tall and short plants were obtained in the ratio of 3:1, Mendel concluded that trait of short height was also present in plants of F1 generation but unable to express itself.



F2 GENERATION.

	T	t	
T	TT	Tt	75% tall
t	Tt	tt	25% short

Phenotypic Ratio
Tall : short
3 : 1

Genetypic Ratio
TT : Tt : tt
1 : 2 : 1

Traits are inherited independently when Mendel cross pollinated round and yellow colour seed pea plant with green and wrinkled seed pea plant in parent generation. All the pea plant which were obtained were having round shape and yellow colour. In order to understand what happened to the trait of wrinkled shape and green colour, he self-pollinated the plants of F1 generation. In F2 generation, he observed that apart from parentals combination some new combinations were also obtained because the trait of shape and colour are not linked to each other but are inherited independent of each other.

PARENT GENERATION

RRYY (Round, Yellow) × rryy (wrinkled, Green)

GAMETES

RY ry

F1 Generation

RrYy
(Round, Yellow)

F2 GENERATION

RrYy × RrYy

Ry Ry ry ry Ry Ry ry ry

	RY	Ry	rY	ry
RY	RRYY	RRYy	RrYY	RrYy
Ry	RRYy	RRyy	RrYy	Rryy
rY	RrYY	RrYy	rrYY	rrYy
ry	RrYy	Rryy	rrYy	rryy

Phenotype ratio
Round yellow : Round green : Wrinkled yellow : Wrinkled green
9 : 3 : 3 : 1

Basis of traits expression

Cellular DNA is source of information for making proteins in cell. A section of DNA that provides information for one protein is called gene (unit of heredity that controls the characteristics of living organism).

Sex Determination

(Determination of sex of an offspring).

Factors responsible for sex determination

Environmental

In some animals the temperature at which the fertilised eggs are kept, determines the sex of offspring.
eg: In turtles.

Genetic

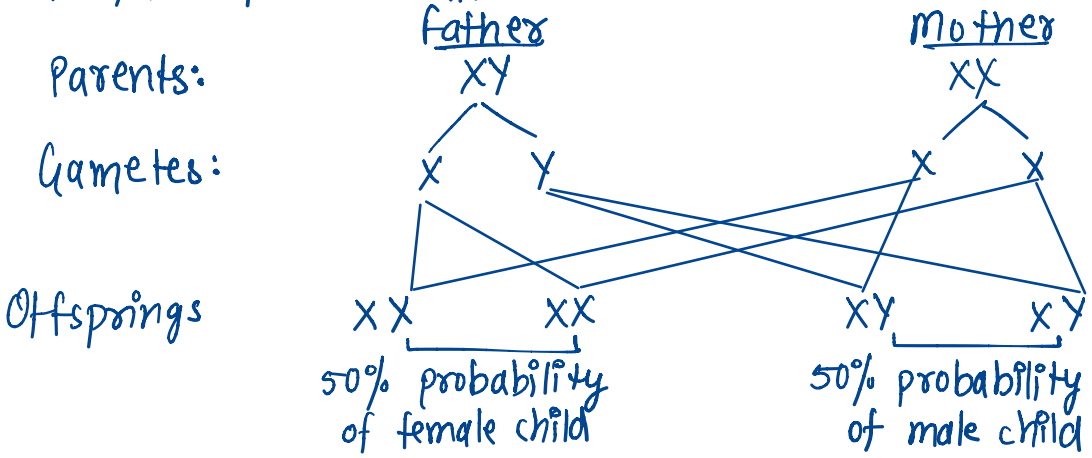
In some animals, determination of sex occurs largely by genetic control, genes inherited from parents determined sex of offspring
eg- in human beings.

In human beings- In human beings, there are 23 pairs of chromosomes (Total - 46 chromosomes), out of which 22 pairs are outcomes and one pair is sex chromosome. These vary in males and female. i.e. Male - XY & female - XX

Sex of the child depends upon what happened during fertilisation-

(i) If sperm carrying X-chromosome fertilise with egg, the child born will be female(XX).
(ii) If sperm carrying Y-chromosome fertilise with egg, the child born will be male(XY).

Thus, the sperm (or male cell) determines the sex of the child.



This shows that half the children will be boys and half will be girls.